Faculty of Engineering

Department of Textile Engineering

Performance of Optical Brightening Agent on knitted CVC Fabric at various parameters

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A thesis submitted in partial fulfillment of the requirements for the degree of

Bachelor of Science in Textile Engineering.

Advance in Wet Processing Technology

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DECLARATION

We sincerely declare that,

This project has been prepared by **Amran Hossen**, **Rezwanul Haque and Md. Abu Tuhin Shaikh** under the supervision of **Abu Naser Md. Ahsanul Haque** , Senior Lecturer, Department of Textile Engineering, **Daffodil International University**. We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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LETTER OF APPROVAL

To

The Head

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102 Sukrabad, Mirpur Road, Dhaka 1207

Subject: Approval of final year project report.

Dear Sir

I am just writing to let you know that, this project report titled as "**Performance of Optical Brightening Agent on knitted CVC Fabric at various parameters**" is completed for final evaluation. The whole report is prepared based on proper investigation and interpretation though critical analysis of empirical data with required belongings. The students were directly involved in their project activities and the report becomes vital to spark off many valuable information for the readers.

Therefore, it will highly be appreciated if you kindly accept this project report and consider it for final evaluation.

Yours Sincerely,

Abu Naser Md. Ahsanul Haque

Senior Lecturer

Department of TE

FE, DIU

ACKNOWLEDGEMENT

At first our gratefulness goes to Almighty Allah to give us strength and ability to complete the industrial training and this report. Without his help or assistance nothing can be done.

Now we wish to thanks a lot of people who have assisted and inspired us in the completion of our training period and completing our report

Abu Naser Md. Ahsanul Haque is our supervisor, to whom we are extremely indebted for his tremendous support and guidance throughout my training period. Being working with him we have not only earned valuable knowledge but also inspired by his innovativeness which helped enrich our experience to a greater extent. His ideas and way of working was truly remarkable.

We would also like to thank **Dr. Md**. **Mahbubul Haque,** Head, Department of Textile Engineering, for giving us opportunity to complete our project report.

Finally we would like to thank **Kanij Fatema**, AGM, Dyeing lab, MICRO FIBRE Group who helped us by giving the opportunity of using their spectrophotometer (data color 650) in their dyeing lab for the evaluation of OBA performance.

DEDICATION

All pleasure goes to the Almighty Allah to give us such strength and ability to complete our whole works in given time.

We would like to dedicate our works and hard labor to our parents. For their inspiration and financial support has been unwavering.

Then we would like to dedicate this whole work to Abu Naser Md Ahsanul Haque, Senior lecturer, Dept. of TE, without his help and collaboration, such works could not be possible.

There are key people who guided and help to our project purpose.

ABSTRACT

Performance of optical brightening agent (OBA) was experimented in different parameters (Temperature, alkali concentration and time) on single jersey CVC (chief value of cotton) knitted fabric. Syno white 4BK was considered as the optical brightening agent. 28 fabric samples were scoured-bleached and then 27 of them were treated with OBA at three different alkali concentration (2 g/l, 4 g/l, 6 g/l) at 70°C, 80°C and 90°C for 10, 20 and 30 minutes.

The results shows that whiteness index at 80°C was greater than 70°C but whiteness obtained at 80°Cand 90°C did not varied much. Whiteness index was better by 4 g/L NaOH than 2 g/L NaOH. But change in whiteness index by 6 g/L NaOH was not significant in comparison with 4 g/L NaOH. On the other hand, application time duration always had an influence in increasing the whiteness index. At 30 minutes time, the whiteness was found highest and in 10 minutes time it was the least.

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CHAPTER-ONE

INTRODUCTION

INTRODUCTION

Wet Processing Technology is an important part of textile processing. Where different chemicals are used for processing textile material. Optical Brightening Agent (OBA) one of treatment process. By which natural and blended fabrics are treatment with OBA during scouring & bleaching or after scouring & bleaching process.

OBA is a colorless or very pale yellow color organic compound. Which increase the light reflectance's of the fabric. OBA also called color less dye. It also increase the whiteness or lightness of fabric. The CVC Fabric we used contains 60% polyester and 40% cotton fiber, and the construction of the fabric is Single Jersey.

In here for the infliction of OBA with blended fabric (CVC) , we used various Temperature, various NaOH amount at different time. OBA actually used for white dyeing. Using of different chemicals at different amount, we have tried to find out which recipe is better for OBA application.

After OBA application, whiteness index is tested by Spectro Photometer.

CHAPTER- TWO

LITERATURE SURVEY

2.1 Introduction:

Optical brightening agents are colored less or very pale yellow colored organic compounds which when added to a substrate increase the apparent reflectance in the visible region by converting ultra violet radiation into visible light and thus increase the whiteness and brightness. An OBA can be called a colorless dye which has some substentivity for the fiber on which it is to be used. For using with different types of fibers, anionic, cationic, and non ionic OBA's are available. The color index lists over 250 such chemicals under the generic name optical brighteners.

Fig 2.1: Optical Brightening Agents (OBA)

Optical brightening agents can also called –

1. Florescent brightening agents
2. Florescent whiteness.
3. Physical bleaching agents,
4. Brighteners
5. White dyes etc.

2.2 History of OBA:

Textile material (cotton, wool, linen and silk) and synthetic (mainly polyamide, polyester and poly acrylo nitrile) are not completely white and effort have been made since ancient time to free from this yellowish tings. Bleaching in the sun, bluing and mater chemical bleaching of textile and other materials increased the brightness of the products and eliminated to a certain hue or the local impurity of the original or industrially treated material.

When optical brighteners first came up they regarded as bleaching auxiliaries which enable short or milder bleach when used in very small quantities (approx 0.001 – 0.05%) they were also called as optical bleaching agents it could be improved with the help of horse chestnut extra acts. This is due to fact the inner back of the horse chestnut contains aesculin or esculinic acid, a glucoside which is derivative of coumain and which has ultra violet fluorescent. Then came the introduction of organic products based on Diamino stilbine sulphonic acid derivatives.

2.3 Reasons for naming physical bleaching agents:

In normal bleaching (chemical bleaching) we use oxidizing or reducing agents (e.g. H_2O_2, NaOCL, etc.).These agents destroy the natural and added coloring matters in the fibres. Thus they give a white effect. It involves chemical reactions, either oxidation or reduction. So they are chemical bleaching agents. On the other hand, Optical brightening agents introduce color complementary to that of the natural coloring matters. It involves no Chemical reaction as bleaching process. So it is called physical bleaching agents.

2.4 Classification of OBA:

The classification of OBA can be either on the chemical structure of the brightener or on its method of application.

They can be classified in to two large groups,

I. Direct (substantive) brightener.
II. Disperse brightener.

I. Direct optical brightening agents are predominantly water soluble substance used for the brightening of natural fibers and occasionally for synthetic material such as polyamide.

a) Disperse optical brightening agents are mainly water insoluble and as with disperse dyes they are applied either to colored from an aqueous dispersion onon they can be used for mass coloration. They are used for synthetic materials such as polyamide polyester acetate.

From the chemical point of view they are classified according to either chemical structure. Chemical optical brightening agents are classified in to derivatives of stlibene, coumarin, 1, 3 diphenylpyrazoline, derivative of naphthalene dicarboxylic acid, derivatives of heterocyclic dicarboxylic acid, derivatives of cinnamic acid and substance belonging to other chemical system.

2.5 Types of Optical Brightening Agent:

According to hue of brightener, these are of three types-

I. OBA with reddish hue
II. OBA with bluish hue
III. OBA with greenish hue.

2.5.1 OBA with reddish hue:

They cause emission of shorter wavelength light. For example, Blancophor R (lever brothers) is an OBA with reddish hue. It is a derivative of di-amino stilbene di sulphonic acid.

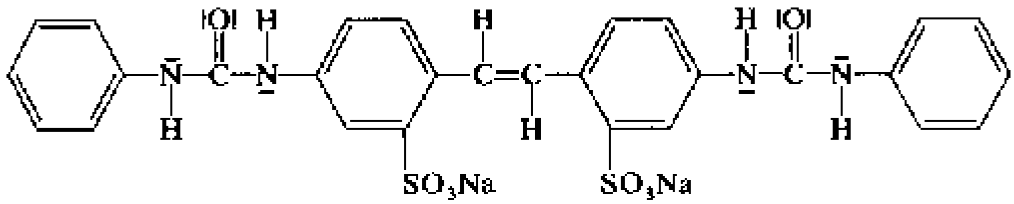

Fig 2.2 OBA with reddish hue

2.5.2 OBA with bluish hue:

This is mostly used and preferred OBA.

E.g: Blankophor B.

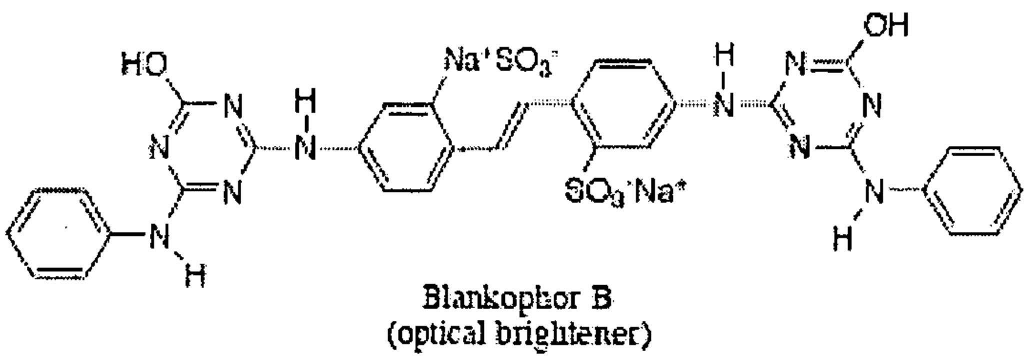

Fig 2.3: OBA with bluish hue

2.5.3 OBA with greenish hue:

At longer wavelengths, they are less in demand. But when they used in conjunction with a reddish-hued whitener, a neutral blue shade is obtained.

E.g. Tinopol B (Cibageigy)

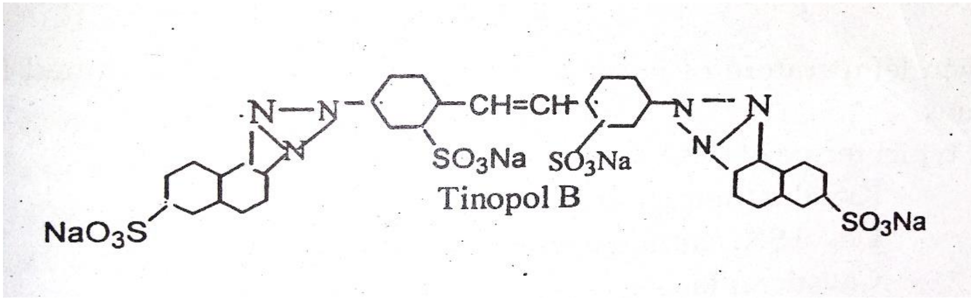

Fig 2.4: OBA with greenish hue

2.6 Whitening of Textile materials:

The whitening whiteness of natural and manmade textile materials can be done in 3 ways-

2.6.1 By chemical bleaching:

In chemical bleaching the color of the impurities is destroyed nearly completely by using oxidizing or reducing agents. For Bleached cotton the curve is not uniform.

2.6.2 By bluing of bleached materials:

Bluing is the treatment of textile materials with insoluble pigments, such as ultramarine dyestuffs. The bluing agents absorb the yellow red portion of incident light. Thus the reflected light is deficient in both components in almost same extent. So the resultant reflectance curve is parallel to that of MgO.

2.6.3 By applying OBA on bleached goods:

Here an additive process restores the color balance, upset by the impurities present in the textile materials. The resultant reflectance curve in red-yellow region is parallel to MgO curve and reflectance value is more than blueing. Again the value of reflectance in blue-

violet region is more than 100%. So the total reflection is increased, resulting a white of outstanding brightness.

2.7Application process of OBA

Optical brightening agent is mostly applied on cotton textile materials. Treatment of cotton with OBA is rarely carried out as a separate process. It is usually incorporated with some other finishing processes. But OBA treatment is a substitution of scouring, bleaching.

Optical brighteners can be applied by-

I. Exhaust method
II. Padding method

This is fixed by subsequent heat treatments.

2.7.1 Exhaust method:

It is a discontinuous method of OBA application. In this method, at first goods are entered in cold liquor (at about 30^0C). Then 0.05% to 0.6% is added to the liquor along with electrolytes (if required). Then temperature of liquor is raised to 100^0C and continued for 30 min.

A typical recipe of OBA treatment along with bleaching-

Kieralon (detergent) -----------0.5 gm/L
DekolSN (wetting agent) -----0.5 gm/L
Caustic Soda ------------------0.5 gm/L
H_2O_2----------------------------0.5 gm/L
Unitex 2B----------------------0.5 gm/L
Time-----------------------------30 min
Temperature--------------------100^0C

After the following after treatment are done-

- Hot wash at 80^0C for 10 min
- DekolSn (0.5 gm/L) at 80^0 C for 10 min
- Hot wash at 70^0 C for 10 min
- Finishing with Redol 10N

2.7.2 Padding method:

Padding method is a continuous method of OBA treatment. Here OBA and salt is taken in bath 40-50^0c.The the fabric is padded. Here P^H is kept neutral or slight acidic.

As OBA gets time to penetrate a medium affinity OBA is referred to avoid the problems of listing and tailing.

2.8 Factors considered for OBA application:

2.8.1. Chemical structure:

The optical brighteners may be stilbene ,pyrazolines, naphathaliides etc. Their ionic nature is to be considered for application on various fibers.

Anionic OBA: cotton, wool, nylon.

Cationic OBA: used mostly for polyacrylonitriles.

No-ionic OBA: polyester, acetate, nylon etc.

2.8.2. Substrate:

Natures of OBA are similar to dyes. Therefore particular OBA is suitable for particular fibre. For example, Tinopal GS is suitable for polyester and Uvitex 2B is suitable for cotton. If Ranipal S is applied on cotton there will be yellow or greenish tones.

2.8.3. Contretation:

Fluorescent intensity is directly proportional to the log of concentration (C) of OBA on fabric under standard condition. Fluorescent intensity is measured usually as Total Radiance Factor (TRF) which is the sum of the reflectance of cloth and fluorescent emission. Thus

TRF= a logc + b

Here, a,b = arbitrary concentration

C= concentration of OBA

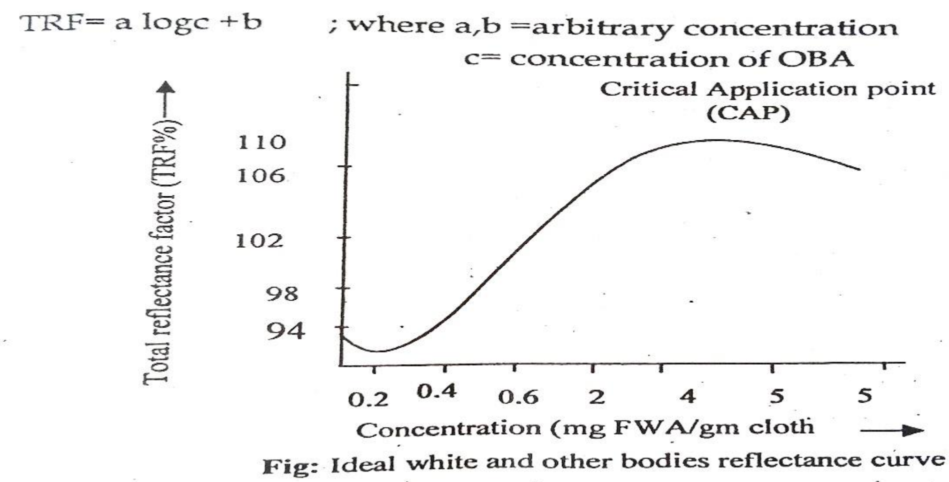

Fig 2.5: Ideal white and other bodies reflectance curve

For every OBA, there is an optimum concentration of OBA, which is known as critical point. Above this point there is a marked decrease in whitening effect. It means, maximum visual whiteness is produced with the concentration of OBA on fibre which just suffices to compensate the yellow hue of substrate. The concentration for different fibres are-

Cellulose: 0.05-0.6 % owf in exhaust method

0.05-2 gm/L in padding method

Protein: 0.02-0.2 % owf

Polyester: 0.1-2 % owf

Nylon: 0.05-.5 % owf

The concentration level is 0.1-5 mg/grain for cotton.

2.8.4. Temperature:

Exhaustion and penetration of OBA depends on temperature. Generally at higher temperature exhaustion becomes poor. The optimum temperature of operation for cotton is 40^0-60^0 C, above 60^0C temperature rate decreases.

The optimum temperature for-

Protein--- 40^0C

Nylon----- 40^0-70^0C

Polyester--- 40^0C-50^0C finally 100^0C

2.8.5. Time:

As the exhaustion rate is very high, so we get equilibrium very quickly and hence operation time is short. For long liquor process time is 15-20 mins.

2.8.6. pH:

Stability, efficiency and depends on pH. The pH for different fibres are-

Acrylic---- 2-4

Protein---- 3-5

Polyester--- 6-7

Cotton------ 7-8

2.8.7. Salt sensitivity:

For lower affinity OBA 5 gm/L salt should be used in the bath, when it is applied on the cellulosic materials. After salt addition, the exhaustion rate will be double. For this purpose, glauber salt is used. But in case of high OBA, there is no effect of salt addition, which can be mentioned.

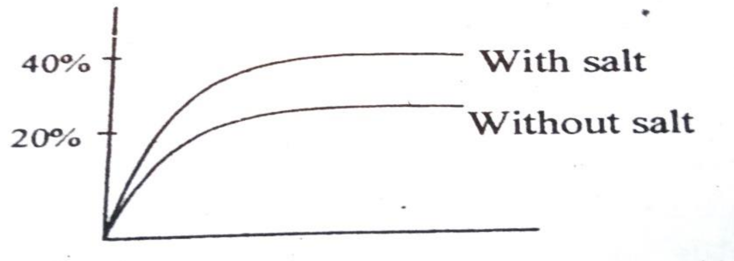

Fig 2.6: Effect of salt.

2.8.8. Fastness:

Fastness if OBA is not so good for cellulosic fibres.

Light fastness: very poor- 2-3,

Washing fastness: 2-4

Washing at 5 gm/L soap at 60^0C

For polyester light fastness: 4-5

Wash fastness: 4-5

Padding and normal dyeing and curing 120-160^0C.

2.9 Chemistry of optical brighteners and its mechanism.

Near about 80% of all OBAs produced are derived from stilbene derivatives, the latter absorbency in the ultra violet regions at (λ) = 342 nm. All the OBAs are dyestuffs, but in place of the chromophoric system which is the characteristic for dyes, it contains a fluorescening system and like a normal dye certain substituents which promote the affinity depending on the type of fiber on which it is applied. In this manner brighteners which are suitable for cotton are more are less substantive derivatives of diamino stilbene di sulphonic acid.

This stiblene derivative can be present in two isomeric forms, i.e. in the Cis configuration and in the Trans configuration .Optical brighteners in the Trans form can be made both in the powder and Liquid form. The Cis form, which is rapidly formed under the action of light form the Trans form will not go on cotton and for this reason, the solution of this whitener is protected against light. Many of the optical brighteners are derived from the heterocyclic compounds containing nitrogen atoms.

Fluorescence is produced by the absorption of radiation having a high energy on the part of the molecule, which re – emits this radiation of lower energy i.e. of longer wave length, the difference in energy being transformed in to kinetic energy. To enable a molecule to fulfill this function, it must be built according to certain structure principles. For example Anthranilic acid has very strong blue violet fluorescence in the aqueous solution, but nevertheless unsuitable as a brightener. Most of the brightener will hardly fluoresce in powder form; their fluorescence will only appear in solution. There are some types, which will not fluoresce in solution and will only show this property after they have been applied on the fiber. Thus, it can be concluded that fluorescence is not only depended on the structure of the molecule but also on its condition. Whether a fluorescent substance is suitable as brightener can only be determined after it has been applied to the textile fiber. Apart from this the product must meet certain demands in respect of properties such as fastness to washing and light etc .On comparering different textile fabrics treated with different brighteners and processing approximately the same brightness difference in hue can be deleted, since the human eye is particularly sensitive to difference in whiteness. If an optically brightened fabric with radish white shade is compared with another fabric having a greenish white shade both of which appear to be equally brilliant if viewed in daylight which is incident from a northerly direction, it will be seen that the greenish shade will appear more brilliant then the radish one in bright sunlight.

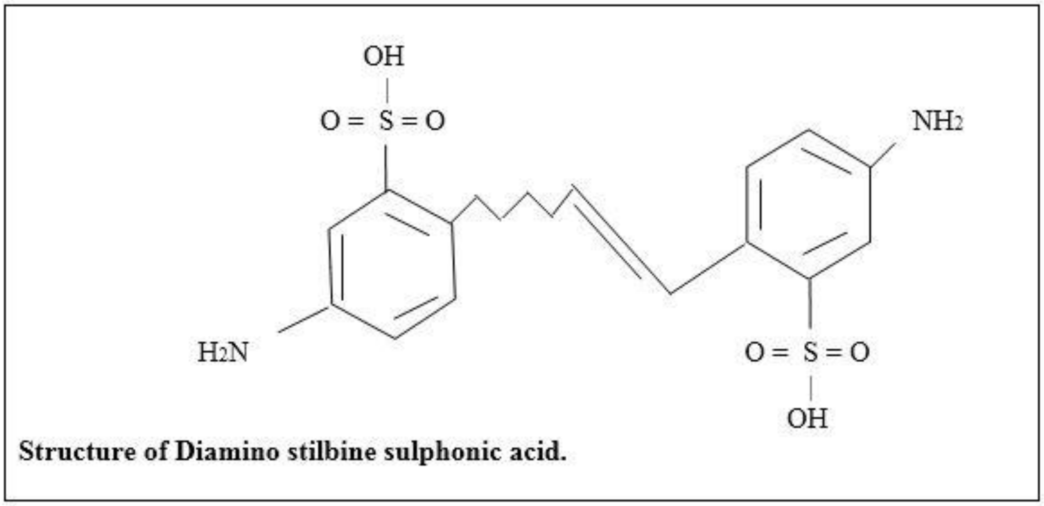

Fig 2.7 Structure of Diaminostilbinesulphonic acid

2.10Properties:

2.10.1 Whiteness & Brightness:

To the trained observer, even bleached are whit textile material has a slight yellow tinge. This small amount of yellow can give the impression of slight soiling and may detract from their aesthetic appeal the presence of slight amount of blue gives the impression that the textile material is whiter. Before advent of OBAs. Improved whiteness was obtained using a laundry blue, which is a blue pigment.

The development of OBAs had meant that this slight addition of blue can be obtained through the light reflected by the OBAs in the presence of ultraviolet radiation. This makes white textile whiter and brighter. Colored textile materials tend to appear brighter. OBAs are present in most domestic but these are usually only suitable for cellulosic textile material.

2.10.2 Light fastness:

There is large variation in the light fastness rating of these compounds when applied to celluosic and protein fibers their light fastness range 1 to 2, and in some instance may reach 3. It should be pointed out that this poor light fastness is not too important in the cause of

cellulosic's, since any loss of OBAs effect due to sunlight will be replaced in subsequent laundering with domestic detergent. Fluorescent brighteners on xylon can reach a light fastness rating 4 with selected OBAs, a rating as high as 7 for polyesters, and in this class of acrylic fibers a light fastness of about 4 – 5.

The poor overall light fastness of fluorescent brighteners is due to their continuous absorption & emission of light which result in their chemical degradation.

2.10.3 Washing fastness:

The washing fastness rating of fluorescent brighteners is about 3. The fair washing fastness of fluorescent brighteners is due to partly to their lack of substantively of textile material and their gradual degradation by exposure to sunlight. The fair washing fastness may not be noticeable in cellulose because of the presence OBAs in domestic detergents when fluorescent are used on other fibers they are applied in the manufacturing situation and brighteners are chosen which will last the expected life of the textile article.

2.10.4 Metameric effect of OBA:

What is metamerism ? A normal phenomenon relating to how the human eye perceives color. It occurs when "two different color object have the same color appearance to normal human viewer under one light source (metameric match) but look different under another light source(metameric mismatch)" To a print marker, this means that the painstakingly precise color information applied to each print will be compromised whenever that print in viewed under a different light source. Thus, one primary goal of any print marker should be to avoid metamerism in order to validate the time spent on color management and to uphold the integrity of the reproduction. After all, what good is reproduction if it does? Now that we understand metamerism and why it should be avoided, how do OBAs fit into the picture? When OBAs are exposed to UV light, the treated paper appears brighter and whiter. When OBAs are not exposed to UV light (in the evening), the OBAs "lose activity" causing your eye to actually see the paper color without OBAs. This will look creamy or somewhat yellowed. This amount of "OBAs activity loss" will vary constantly depending upon how

much exposure the paper has to UV light. Picture the lightening condition inside of an art gallery and how they will change depending upon the time of day. This will have subsequent effect on the art itself; your print could be illuminating the print. It a case like this, where there is a high UV component, inkjet papers that contain OBAs will strongly fluoresce and will appear bright white. However, in the evening when the same print is displayed with low or non – existent UV component (or incandescent tungsten illumination), the OBAs will not fluoresce, making the paper appear yellow, therefore causing your eyes to see the image color differently.

2.11 Blending:

Blending is the combining of different fibers together intimately to achieve a desired product characteristic. Blends can influence coloring, strength, softness, absorbency, ease of washing, resistance to wrinkling, ease of spinning, cost, etc.

2.12 Reasons for blending

All textile fibers have their own inherent characteristics in terms of market value, look, feel, physical as well as chemical properties, etc., due to which products made of any one among these is not capable of meeting all the end use requirements. This has prompted to blend fibers to reduce cost of product and to balance physical prospects like look, tensile properties, moisture regain, comfort, crease recovery, etc., finally paving way for overall improvement in aesthetic properties of textiles.

Fibers can be blended in two major ways, e.g. intimate and physical blending. Intimate blending is of conventional type in which staple fibers of various textiles are mixed thoroughly and spun together to get the blended yarn or spinning two compatible polymers by mixing in the autoclave. In contrast, physical blending is carried out during weaving to produce union or blended fabrics; alternately it may also be done in synthetic

fibermanufacturing stage by mixing and spinning two compatible molten or liquefied polymers coming out of two different spinnerets (Nunn, 1979).

When two or more fibers are blended, the resultant textile may be dyed with a uniform hue and shade in 1-bath if a specific class of dye show affinity for both the components, i.e. if component fibers are anionic they may react with cationic dyes, e.g. dyeing of acrylic–wool blend; dissimilarity in electrical nature in component fibers enables to produce various fancy shades as the resultant blend is not dye able in 1-bath with only one class of dye. In fact, depending on type of fibers in blend, fancy dyeing effects can easily be Dyeing of blend 283 produced. Attempts are to be made if the shade can be produced in 1-bath 1-step dyeing; such a move reduces handle of textile and wastage of energy, lesser water consumption, etc. Before moving to discuss dyeing of blends in detail, it is mandatory to know some basic information required to handle the dyeing process, viz. nature of component fibers and blends, types of shades and dyeing methods.

2.13 Scouring

Scouring is the process by which natural (oil, wax, gum, fat etc) as well as added (during fabrication process) impurities are removed completely as possible. Especially hydrophobic character which is present in the fiber of fabric is removed by this process.

2.13.1Objectives of Scouring:

Scouring process has some important objectives. The objectives of scouring process are given bellow:

1. The main purpose of the scouring is to remove impurities from the textile materials.
2. The textile materials are left in a highly absorptive condition without undergoing any chemical or physical damage significantly.
3. After scouring process materials become suitable for next bleaching process.

2.13.2 Effects of Scouring:

Followings changes occurred during scouring process:

1. Saponifiable oils and free fatty acids are converted into soaps.
2. Pectose and pectin are changed into soluble salts of pectic acid.
3. Proteins are hydrolysed into soluble degradation products.
4. Mineral matters are dissolved in the water.
5. Unsaponifiable oils and waxes are emulsified by the soaps formed from saponification.
6. Dust particles are removed and held in suspension.

In above I have written about Saponification. So, the reaction by which the insoluble and water immiscible materials are converted into water soluble products is called saponification. The reaction is as follows:

Oil + Caustic soda + Water = Soap + glycerin

2.14Methods of Scouring:

Scouring process is done by the following two ways. They are:

2.14.1 Continuous process:

In this process scouring of the fabric is done continuously in a JBox. In this machine pretreatment and dyeing process are done continuously. This type of application is very limited.

2.14.2 Discontinuous process:

This type of process also called batch process. Here scouring is done discontinuously in Kier Boiler, Jigger or Winch dyeing machine. Before dyeing different batch or lot is created.

In the dyeing machine different controlling parameters are controlled strictly. I like to give a sample recipe of scoring process of cotton in kier boiler.

Caustic Soda = 0.5 to 3% on the weight of fabric owf

Sodium-bi-Carbonate = 0.5 to 1% owf

Wetting Agent = 0.5 to 1% owf

Materials: Liquor = 1: 6/8/10/12 (as required)

Temperature = 100 to 140 degree Celsius

Pressure = 10 to 30 PSI

Time = 60 to 90 minutes

Material forms = Rope or Open width

Scouring is generally done for natural fiber. Better dyeing or printing performance depends on better scouring of the materials. Otherwise different types of dyeing or printing faults are appearing on the face of the fabric. So, it needs to take care on scouring process. It also depends on the shade of the fabric. Generally it is important for light shade dyeing.

2.15 Bleaching

Bleaching is the second steps of pretreatment of textile materials as well as wet processing technology. Bleaching process can be defined as; the destruction of natural coloring matter from the textile materials in order to achieve a clean white end product. Different types of bleaching agent use during bleaching.

2.15.1Objectives of Bleaching:

Different types of objectives are gained by the bleaching process. Followings are the objectives of bleaching:

1. The main objectives of bleaching are to get a sufficiently high and uniform degree of whiteness in the textile materials.
2. To get a high and uniform absorptivity in the textile materials.
3. Bleaching agent occur some damage to the textile materials. So bleaching must be accompanied with minimum fiber damage.
4. To preserve a good user and technological properties of the textile materials.

5. The process must be ecologically and financially sensible.

6. To accelerate the next dyeing process.

Bleaching agent is alkaline in properties. Before using it one should have deep knowledge about different types of bleaching agents. Different types of bleaching agent are available in the market. Some are strong and some are weak in alkaline nature. So, we have to idea about which bleaching agent is suitable for which type of fabric. Following process parameters for bleaching must be considered. Points are as follows:

I. Bleaching agents have a chemical construction. During bleaching; the chemistry ofbleaching.

II. The concentration of bleaching agents and other chemicals which use in the bleaching process.

III. Bleaching is generally done in alkaline medium of the bath. Bath pH decides theperformance of bleaching. So pH of the bath should be considered.

IV. Temperature of the bath should be considered during process of bleaching.

V. Bleaching performance also affected by the duration of bleaching. So, time is animportant factor.

VI. Materials and liquor ratio also considered during bleaching process.

VII. Scouring is done for removing impurities of fabric or fiber. If scouring process is notsuccessfully done then presence impurities hamper the bleaching performance. So,presence of impurities in the materials is important point for bleaching operation.

VIII. Bleaching agents are sensitive to atmospheric condition. So, storage condition ofbleaching agent is important. The place of storage should be neat, clean and dry.Otherwise the working activities could be damaged.

CHAPTER-THREE

EXPERIMENTAL DETAILS

Fabric

3.1 CVC

CVC fabric refers to “Chief Value Cotton” fabrics that are made from combining cotton with polyester. Cotton is a naturally derived fabric, and when it is combined with synthetic fibers like polyester, the fabric is called CVC.

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Although cotton is generally preferred in terms of comfort, textile making companies frequently combine polyester with cotton for a variety of reasons. One such reason is to make clothes more durable. Cotton by itself is considered very soft, and it easily deforms and shrinks. Cotton shirts that are 100 percent cotton, for example, may be very cool to the skin and provide great comfort, but over several uses and washes, the shirts are easily deformed, and they are also more prone to shrinking. By combining polyester to the cotton fabric, garments will become more durable with less chance of deforming and shrinkage. With the demands of everyday activities, people will welcome clothes that can be worn for a long time. By combining cotton with polyester, fabric sheets are created with less expense for the textile manufacturer. And since CVC fabric is less expensive due to its polyester content, many people also refer to CVC fabrics as “the poor man’s cotton.”

3.1.1 Fabric Specification

Table No 3.1: Table for fabric specification:

Parameter	Scoured Bleached CVC fabric
Structure	Single Jersey
Yarn Count	26/1
Yarn Type	Combed Yarn
Stitch length	3.05
GSM	160

3.2 Chemicals used in scouring and bleaching:

Detergent (Felason RGN)

Function:

- It removes impurities, mineral oil contamination and sizes from the garments.
- Scouring of goods for dyeing and printing fully white and colored articles.

Sequestering Agent

Function:

- It is used to soften the hard water.
- It is used where is a trace of ion or other metallic contamination might cause flattening of the shade.

Antifoaming Agent:

Function:

- To prevent foam generation during dyeing and printing.

Peroxide Stabilizer:

Function:

- It reduces the rate of degradation of hydrogen peroxide.

Caustic Soda (alkali):

Function:

- Caustic created the role in bleach technique without color change the garment and has a good cleaning power.
- It is work as fading affect/old looking affect come rapidly on garments.

Hydrogen peroxide (H_2O_2):

Function:

- It destructs the natural coloring matters to produce a permanent white effect on the textile materials.
- It is a cleaning process.

3.3 Chemicals used in OBA application:

Optical Brightening Agent (Syno White 4BK)

Function:

- It often used to enhance the appearance of color of fabric.
- It is used to make the fabric whiter.

Wetting Agent:

Function:

- To wet the fabric as well as dyestuff.
- To reduce surface tension of water allowing the dyestuff for easy penetration into fiber.

Caustic Soda (alkali):

Function:

- Caustic created the role in bleach technique without colour change the garment and has a good cleaning power.

It is work as fading affect/old looking affect come rapidly on garments.

3.4 Machine & Equipment's

There are several types of apparatus used in OBA application.

3.4.1 Apparatus

I. Beaker
II. Pipette

III. Thermometer
IV. Glass rod
V. Gas burner
VI. Digital balance
VII. Dye Bath
VIII. Scissors

3.4.2 Equipment

For evaluation of OBA effect, after applying OBA Spectophoto meter used with two different light sources namely,

- D65
- TL83.

Table No 3.2: Equipment used for measuring whiteness index:

Name	Origin	Model
Spectrophotometer	USA	Datacolor 650

3.5 Recipe for Scouring and Bleaching at combined stage:

Detergent--------------------------1 gm/L Stock Solution--------1%

Sequestering Agent--------------1 gm/L Stock Solution--------1%

Anticreasing --------------------0.8 gm/L Stock Solution--------1%

Stabilizer ------------------------1 gm/L Stock Solution--------1%

Custic Soda ---------------------2 gm/L Stock Solution--------1%

H_2O_2------------------------------ 3 gm/L Stock Solution--------1%

Time ------------------------------ 40 minutes

Temperature---------------------- 98^0 C.

M : L ------------------------------ 1: 40

Sample weight -------------------5 gm

3.6 Recipe of OBA application on CVC fabric

at changing of different parameters (time, temperature, NaOH):

Recipe-1

OBA-------------------------------1% Stock Solution--------1%

Wetting Agent----------------1 gm/L Stock Solution--------1%

NaOH-----------------------------2 gm/L Stock Solution--------1%

Temperature---------------------70^0

Time------------------------------10 minutes

M : L ------------------------------- 1: 40

Sample weight --------------------5 gm

Recipe-2

OBA-------------------------------1% Stock Solution--------1%

Wetting Agent----------------1 gm/L Stock Solution--------1%

NaOH-----------------------------2 gm/L Stock Solution--------1%

Temperature---------------------80^0

Time------------------------------10 minutes

M : L ------------------------------- 1: 40

Sample weight --------------------5 gm

Recipe-3

OBA-------------------------------1% Stock Solution--------1%

Wetting Agent----------------1 gm/L Stock Solution--------1%

NaOH-----------------------------2 gm/L Stock Solution--------1%

Temperature---------------------90^0

Time------------------------------10 minutes

M : L ------------------------------- 1: 40

Sample weight --------------------5 gm

Recipe-4

OBA-------------------------------1% Stock Solution--------1%

Wetting Agent----------------1 gm/L Stock Solution--------1%

NaOH-----------------------------2 gm/L Stock Solution--------1%

Temperature---------------------70^0

Time------------------------------20 minutes

M : L ------------------------------- 1: 40

Sample weight --------------------5 gm

Recipe-5

OBA-------------------------------1% Stock Solution--------1%

Wetting Agent----------------1 gm/L Stock Solution--------1%

NaOH-----------------------------2 gm/L Stock Solution--------1%

Temperature---------------------80^0

Time------------------------------20 minutes

M : L ------------------------------- 1: 40

Sample weight --------------------5 gm

Recipe-6

OBA-------------------------------1% Stock Solution--------1%

Wetting Agent----------------1 gm/L Stock Solution--------1%

NaOH-----------------------------2 gm/L Stock Solution--------1%

Temperature---------------------90^0

Time------------------------------20 minutes

M : L ------------------------------- 1: 40

Sample weight --------------------5 gm

Recipe-7

OBA-------------------------------1% Stock Solution--------1%

Wetting Agent----------------1 gm/L Stock Solution--------1%

NaOH-----------------------------2 gm/L Stock Solution--------1%

Temperature---------------------70^0

Time------------------------------30 minutes

M : L ------------------------------- 1: 40

Sample weight --------------------5 gm

Recipe-8

OBA-------------------------------1% Stock Solution--------1%

Wetting Agent----------------1 gm/L Stock Solution--------1%

NaOH-----------------------------2 gm/L Stock Solution--------1%

Temperature---------------------80^0

Time------------------------------30 minutes

M : L ------------------------------- 1: 40

Sample weight --------------------5 gm

Recipe-9

OBA-------------------------------1% Stock Solution--------1%

Wetting Agent----------------1 gm/L Stock Solution--------1%

NaOH-----------------------------2 gm/L Stock Solution--------1%

Temperature---------------------90^0

Time------------------------------30 minutes

M : L ------------------------------- 1: 40

Sample weight --------------------5 gm

Recipe-10

OBA-------------------------------1% Stock Solution--------1%

Wetting Agent----------------1 gm/L Stock Solution--------1%

NaOH-----------------------------4 gm/L Stock Solution--------1%

Temperature---------------------70^0

Time------------------------------10 minutes

M : L ------------------------------- 1: 40

Sample weight --------------------5 gm

Recipe-11

OBA-------------------------------1% Stock Solution--------1%

Wetting Agent----------------1 gm/L Stock Solution--------1%

NaOH-----------------------------4 gm/L Stock Solution--------1%

Temperature---------------------80^0

Time------------------------------10 minutes

M : L ------------------------------- 1: 40

Sample weight --------------------5 gm

Recipe-12

OBA-------------------------------1% Stock Solution--------1%

Wetting Agent----------------1 gm/L Stock Solution--------1%

NaOH-----------------------------4 gm/L Stock Solution--------1%

Temperature---------------------90^0

Time------------------------------10 minutes

M : L ------------------------------- 1: 40

Sample weight --------------------5 gm

Recipe-13

OBA-------------------------------1% Stock Solution--------1%

Wetting Agent----------------1 gm/L Stock Solution--------1%

NaOH-----------------------------4 gm/L Stock Solution--------1%

Temperature---------------------70^0

Time------------------------------20 minutes

M : L ------------------------------- 1: 40

Sample weight --------------------5 gm

Recipe-14

OBA-------------------------------1% Stock Solution--------1%

Wetting Agent----------------1 gm/L Stock Solution--------1%

NaOH-----------------------------4 gm/L Stock Solution--------1%

Temperature---------------------80^0

Time------------------------------20 minutes

M : L ------------------------------- 1: 40

Sample weight --------------------5 gm

Recipe-15

OBA-------------------------------1% Stock Solution--------1%

Wetting Agent----------------1 gm/L Stock Solution--------1%

NaOH-----------------------------4 gm/L Stock Solution--------1%

Temperature---------------------90^0

Time------------------------------20 minutes

M : L ------------------------------- 1: 40

Sample weight --------------------5 gm

Recipe-16

OBA-------------------------------1%

Stock Solution--------1%

Wetting Agent----------------1 gm/L

Stock Solution--------1%

NaOH-----------------------------4 gm/L

Stock Solution--------1%

Temperature---------------------70^0

Time------------------------------30 minutes

M : L ------------------------------- 1: 40

Sample weight --------------------5 gm

Recipe-17

OBA-------------------------------1%

Stock Solution--------1%

Wetting Agent----------------1 gm/L

Stock Solution--------1%

NaOH-----------------------------4 gm/L

Stock Solution--------1%

Temperature---------------------80^0

Time------------------------------30 minutes

M : L ------------------------------- 1: 40

Sample weight --------------------5 gm

Recipe-18

OBA-------------------------------1%

Stock Solution--------1%

Wetting Agent----------------1 gm/L

Stock Solution--------1%

NaOH-----------------------------4 gm/L

Stock Solution--------1%

Temperature---------------------90^0

Time------------------------------30 minutes

M : L ------------------------------- 1: 40

Sample weight --------------------5 gm

Recipe-19

OBA-------------------------------1% Stock Solution--------1%

Wetting Agent----------------1 gm/L Stock Solution--------1%

NaOH-----------------------------6 gm/L Stock Solution--------1%

Temperature---------------------70^0

Time------------------------------10 minutes

M : L ------------------------------- 1: 40

Sample weight --------------------5 gm

Recipe-20

OBA-------------------------------1% Stock Solution--------1%

Wetting Agent----------------1 gm/L Stock Solution--------1%

NaOH-----------------------------6 gm/L Stock Solution--------1%

Temperature---------------------80^0

Time------------------------------10 minutes

M : L ------------------------------- 1: 40

Sample weight --------------------5 gm

Recipe-21

OBA-------------------------------1% Stock Solution--------1%

Wetting Agent----------------1 gm/L Stock Solution--------1%

NaOH-----------------------------6 gm/L Stock Solution--------1%

Temperature---------------------90^0

Time------------------------------10 minutes

M : L ------------------------------- 1: 40

Sample weight --------------------5 gm

Recipe-22

OBA-------------------------------1% Stock Solution--------1%

Wetting Agent----------------1 gm/L Stock Solution--------1%

NaOH-----------------------------6 gm/L Stock Solution--------1%

Temperature---------------------70^0

Time------------------------------20 minutes

M : L ------------------------------- 1: 40

Sample weight --------------------5 gm

Recipe-23

OBA-------------------------------1% Stock Solution--------1%

Wetting Agent----------------1 gm/L Stock Solution--------1%

NaOH-----------------------------6 gm/L Stock Solution--------1%

Temperature---------------------80^0

Time------------------------------20 minutes

M : L ------------------------------- 1: 40

Sample weight --------------------5 gm

Recipe-24

OBA-------------------------------1% Stock Solution--------1%

Wetting Agent----------------1 gm/L Stock Solution--------1%

NaOH-----------------------------6 gm/L Stock Solution--------1%

Temperature---------------------90^0

Time------------------------------20 minutes

M : L ------------------------------- 1: 40

Sample weight --------------------5 gm

Recipe-25

OBA-------------------------------1% Stock Solution--------1%

Wetting Agent----------------1 gm/L Stock Solution--------1%

NaOH-----------------------------6 gm/L Stock Solution--------1%

Temperature---------------------70^0

Time------------------------------30 minutes

M : L ------------------------------- 1: 40

Sample weight --------------------5 gm

Recipe-26

OBA-------------------------------1% Stock Solution--------1%

Wetting Agent----------------1 gm/L Stock Solution--------1%

NaOH-----------------------------6 gm/L Stock Solution--------1%

Temperature---------------------80^0

Time------------------------------30 minutes

M : L ------------------------------- 1: 40

Sample weight --------------------5 gm

Recipe-27

OBA-------------------------------1% Stock Solution--------1%

Wetting Agent----------------1 gm/L Stock Solution--------1%

NaOH-----------------------------6 gm/L Stock Solution--------1%

Temperature---------------------90^0

Time------------------------------30 minutes

M : L ------------------------------- 1: 40

Sample weight --------------------5 gm

3.7Calculation for Scouring and Bleaching:

Dye = $\frac{\text{Sample Weight X Chemical In \%}}{\text{Stock Solution \%}}$

Detergent = $\frac{Total\ Liquor\ X\ Chemical\ in\ gm/L}{1000\ X\ \text{tock Solution \%}}$

Total Liquor = 5 X 40 =200 ml

Detergent =$\frac{200\ X\ 1}{1000\ X\ 1\%}$ = 20 ml

Sequestering agent = $\frac{200\ X\ 1}{1000\ X\ 1\%}$ = 20 ml

Anti creasing Agent = $\frac{200\ X\ 0.8}{1000\ X\ 1\ \%}$= 16 ml

Stabilizer = $\frac{200\ X\ 1}{1000\ X\ 1\ \%}$ = 20 ml

Custic Soda = $\frac{200\ X\ 2}{1000\ X\ 1\ \%}$ =40 ml

H_2O_2 = $\frac{200\ X\ 3}{1000\ X\ 1\%}$=60 ml

Total Water Required = [200 - (20+20+16+20+40+60)]

= 24 ml

3.8 Calculation for OBA application:

3.8.1 Recipe – (1-9)

Total Liquor = 5 X 40 = 200 ml

OBA $= \frac{5\ X\ 1\ \%}{1\%}$ =5 ml

Wetting Agent $= \frac{200\ X\ 1}{1000\ X\ 1\ \%}$= 20 ml

NaOH $= \frac{200\ X\ 2}{1000\ X\ 1\ \%}$=40 ml

Total Water Required = [200 - (5+20+40)] =135 ml

3.8.2 Recipe – (10-18)

Total Liquor = 5 X 40 = 200 ml

OBA $= \frac{5\ X\ 1\ \%}{1\%}$ =5 ml

Wetting Agent $= \frac{200\ X\ 1}{1000\ X\ 1\ \%}$= 20 ml

NaOH $= \frac{200\ X\ 4}{1000\ X\ 1\ \%}$=80 ml

Total Water Required = [200 - (5+20+80)] =95 ml

3.8.3 Recipe – (19-27)

Total Liquor = 5 X 40 = 200 ml

OBA $= \frac{5\ X\ 1\ \%}{1\%}$ =5 ml

Wetting Agent $= \frac{200\ X\ 1}{1000\ X\ 1\ \%}$= 20 ml

NaOH $= \frac{200\ X\ 6}{1000\ X\ 1\ \%}$=120 ml

Total Water Required = [200 - (5+20+120)] =55 ml

3.9 Working procedure:

- At first we took 140 gm of CVC (60% polyester+40% cotton) knitted fabric and cut them into 28 pieces of sample each weighting 5 gm. Among them 27 sample are for experiment and 1 sample is standard.
- Then we scoured and bleached the samples with various chemicals like detergent, sequestering agent, antifoaming agent, hydrogen peroxide, caustic soda, peroxide stabilizer etc at 98° C for 60 minutes at combined stage.
- At first we rinse the fabric, then put the samples into the dye bath and took necessary chemicals and scoured and bleached. During scouring and bleaching process we maintained the pH of the solution and checked it with pH meter.
- After scouring and bleaching we washed in cold water and dried the samples.
- Following the above procedure done for residual 26 samples.
- For OBA application we have changed three parameters, such as concentration of NaOH, time and temperature.
- We maintain 70° C, 80° C, 90° C temperatures, concentration of NaOH 2gm/L, 4gm/L, 6 gm/L and time 10, 20, 30 minutes alternatively in various samples.
- For OBA application we have used 4BK, wetting agents and caustic soda. At first we rinsed the samples with cold water, then put the samples into dye bath with necessary chemicals and gave particular temperature for individual sample for particular time and temperature.
- Repeated this procedure by changing the parameters.
- Then washed the sample with cold water, later dried the samples carefully.
- Then queued up the samples according to the parameters.
- At last we assessed the samples in TL83 and D65 lights to measure its whiteness index.
- For assessment at first we measured the whiteness index of the standard sample, then we measured the whiteness index of the other samples under D65 and TL83.
- Then we compared the whiteness index between the standard sample and the OBA treated sample, we also measured the color difference.

3.10 Measurement of whiteness index

After finishing of OBA application, we measure the whiteness index of OBA treated fabric. Here two light source is used, D65 and TL83. D65 have high coloring index. Other hand TL83 have comparatively lower coloring index than D65 light source.

At first specimen is placed in the aperture. Then the machine calculates the whiteness Index and give output in the monitor. Afterwards we print out the result. The result is given below-

Table No 3.3: Whiteness index in D65

NaOH	Temperature	Time In Min.	Whiteness Index (Standard)	Whiteness Index(After OBA)	Change in WI
			D65	D65	D65
2 g/L	70^0C	10	70.53	70.58	0.05
		20	70.53	73.61	3.08
		30	70.53	74.17	3.64
	80^0C	10	70.53	75.38	4.85
		20	70.53	76.22	5.69
		30	70.53	77.20	6.67
	90^0 C	10	70.53	75.20	4.67
		20	70.53	75.51	4.98
		30	70.53	77.20	6.67
4 g/L	70° C	10	70.53	73.89	3.36
		20	70.53	74.26	3.73
		30	70.53	77.49	6.96
	80°C	10	70.53	75.06	4.53
		20	70.53	75.72	5.19
		30	70.53	77.79	7.26
	90° C	10	70.53	76.71	6.18
		20	70.53	77.79	7.26
		30	70.53	77.69	7.16
6 g/L	70° C	10	70.53	72.15	1.61
		20	70.53	76.35	5.82
		30	70.53	77.15	6.62
	80°C	10	70.53	76.27	5.74
		20	70.53	77.21	6.68
		30	70.53	77.80	7.27
	90° C	10	70.53	76.85	6.31
		20	70.53	77.69	7.16
		30	70.53	77.86	7.33

CHAPTER – FOUR

Discussion of Results

4.1 Effect of different parameter 2 gm/L NaOH:

In figure we represent time, temperature and concentration of NaOH at X axis and whiteness index at Y axis.

Where we can see that in 70^0 C in 10 minute the whiteness index is almost same as before treatment. After that time and temperature is high the whiteness index is also higher. We can also mention that, whiteness index for the 80^0 C we see that at 10 minute result is less than 20 minute. Again for that the change of whiteness index is better at 30 minute. Here we can see that at 80^0 C in 30 minute and at 90^0 C in 30 minute the whiteness index is better and give its maximum value for 2 g/L NaOH.

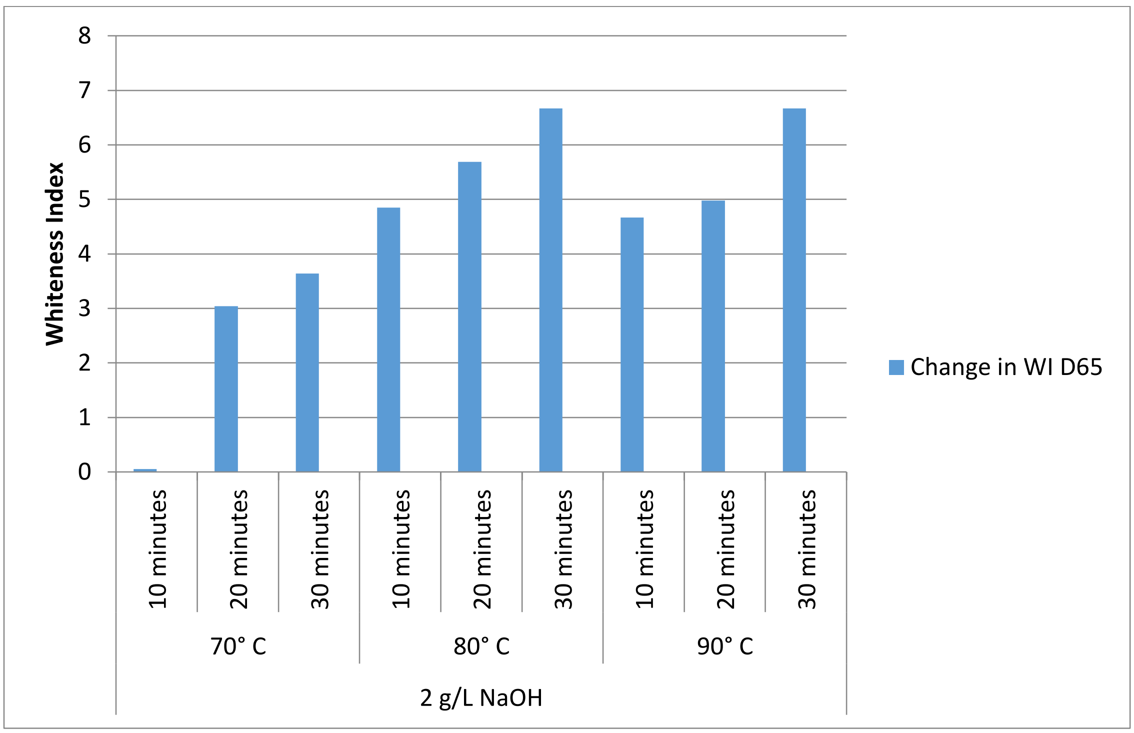


Fig 4.1: Whiteness index at D65 for 2 gm/L NaOH

4.2 Effect of different parameter 4 gm/L NaOH:

In figure we represent time, temperature and concentration of NaOH at X axis and whiteness index at Y axis.

In figure, we see that the result for 10 minutes is comparatively better than 2 g/l NaOH. After that time and temperature is high the whiteness index is higher. We can also mention that whiteness index for the 70^0C and 80^0 C at 10 minute result is less than 20 minute. Again for that the change of whiteness index is better at 30 minute. We also see that at 90^0 C at 10 minute result is less than 20 minute again in 20 minute is better than 30 minute. Here we can see that at 80^0 C in 30 minute and at 90^0 C in 20 minute the whiteness index is better.

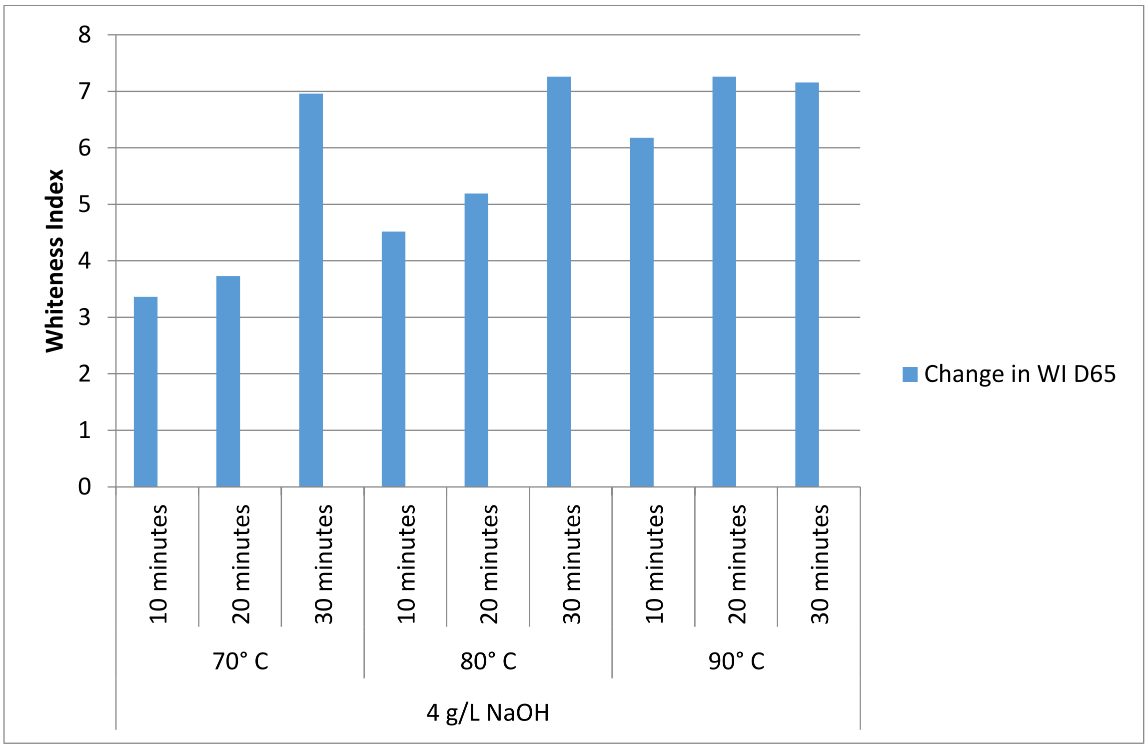


Fig4.2: Whiteness index at D65 for 4 gm/L NaOH

4.3 Effect of different parameter 6 gm/L NaOH:

In figure we represent time, temperature and concentration of NaOH at X axis and whiteness index at Y axis.

In figure, we see that the result for 10 minutes is comparatively less than 4 g/l NaOH, but it is better than 2 g/L NaOH. After that time and temperature is high the whiteness index is higher. We can also mention that for whiteness index for the 80^0 C we see that at 10 minute result is less than 20 minute. Again for that the change of whiteness index is better at 30 minute. Here we can see that at 80^0 C in 30 minute and at 90^0 C in 20 and 30 minute the whiteness index is better

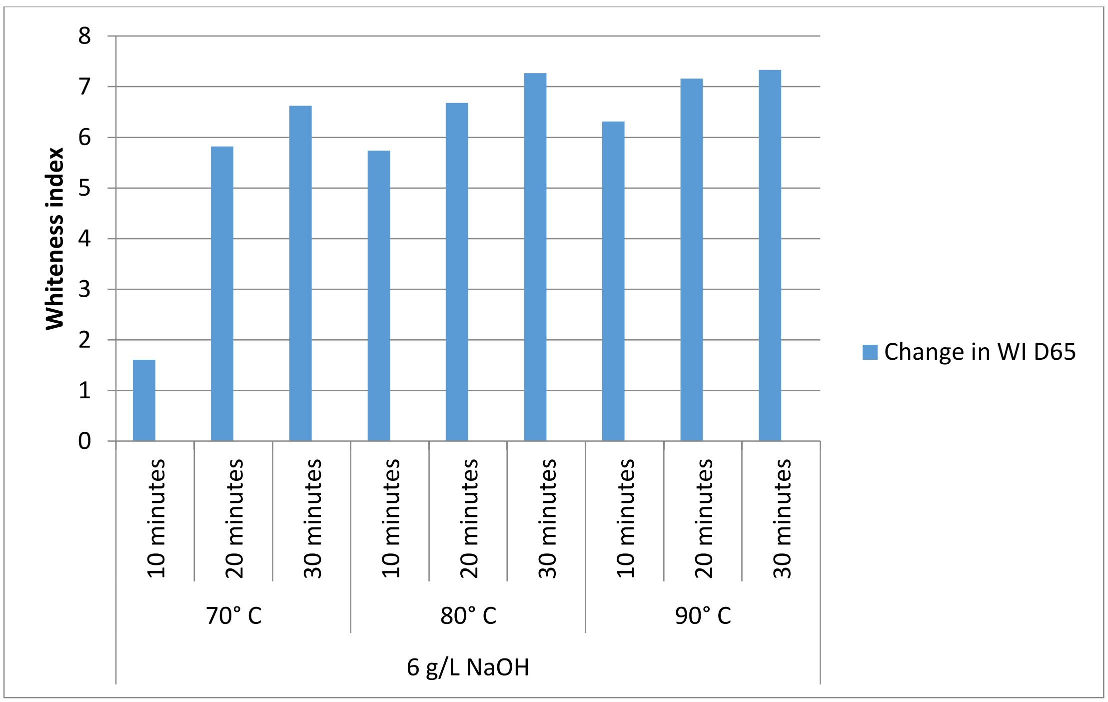


Fig 4.3: Whiteness index at D65 for 6 gm/L NaOH

4.4 All Over Result

In figure we represent time, temperature and concentration of NaOH at X axis and whiteness index at Y axis.

Before we see that at 70^0 C and in 10 minute for all temperature the result is not good than 80^0 C and 90^0 C. For this why here we want to show the result at 80^0 C and 90^0 C in graph for 20 and 30 minute. Here we see that for higher concentration of NaOH about 4 and 6 gm/L is give good whiteness effect. Again we see that at 30 minute the result is always better. So if we give 4 or 6 gm/L of NaOH concentration and maintain at 30 minute temperature the whiteness effect is better for CVC (60 % polyester and 40 % cotton) fabric.

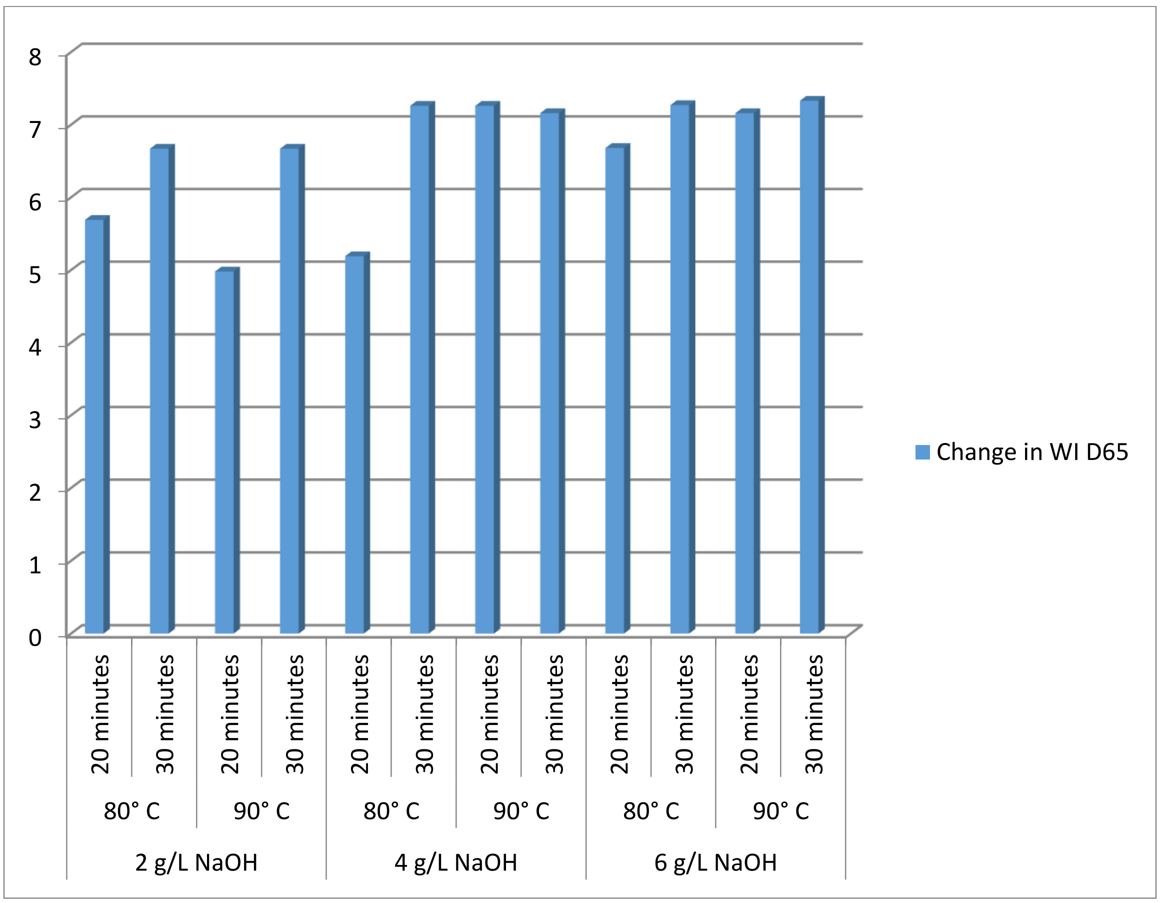


Figure4.4: Whiteness index at all parameter.

CHAPTER- FIVE

CONCLUSION

CONCLUSION

In ourthesis we tried to find out the performance of OBA in different parameters (temperature, alkali concentration and time) on CVC fabric.The results shows that temperature and alkali concentration increasesthe whiteness index on the fabric up to a certain level.

Though Whiteness index at 80°C was greater than 70°C,the results of 80°Cand 90°C did not varied so much. In case of increasing alkali concentration, 4 g/L NaOH gave better whiteness than 2 g/L NaOH, but change in whiteness index by 6 g/L NaOH was not significant in comparison with 4 g/L NaOH. On the other hand, application time duration always had an influence in increasing the whiteness index. At 30 minutes time, the whiteness was found highest and in 10 minutes it was the least.

REFERENCES

Above information are collected from different sources. These are given below:

1. Md. Moshiur Rahman, Wet Processing III, Brother's Publication, Third Edition, March 2011
2. http://textilelearner.blogspot.com/2012/09/process-flow-chart-of-knitting.html#ixzz3nhXkkWQd
3. http://textilelearner.blogspot.com/2012/01/single-truck-single-jersey-circular_29.html#ixzz3nkX0GP2w
4. http://textilelearner.blogspot.com/2013/01/process-flow-chart-of-batching-section.html#ixzz3o46cYNsh
5. http://garmentstech.com/causes-and-remedies-of-various-knitting-faults/
6. http://textilelearner.blogspot.com/2013/01/process-flow-chart-of-batching-section.html#ixzz3o4CjajW2

APPENDIX

MICRO FIBRE GROUP

RAMERBAGH, KATUBPUR, FATULLAH, N-GONJ.

BUYER: SMRITI

Date Batch Measured: 03- Nov-2015

STD: STD

	STD WI	BAT WI	DELTA WI
TL83 10 Deg	70.53	70.58	0.05
D65 10 Deg	70.53	70.58	0.05

MICRO FIBRE GROUP

RAMARBAGH,KATUBPUR,FATULLAH,N-GONJ.

BUYER:SRITI

Date Batch Measured: 03-Nov-15

STD: STD 3

Sample- 2

	STD WI	BAT WI	DELTA WI
TL83 10 Deg	70.53	73.61	3.08
D65 10 Deg	70.53	73.61	3.08

MICRO FIBRE GROUP

RAMARBAGH,KATUBPUR,FATULLAH,N-GONJ.

BUYER:SRITI

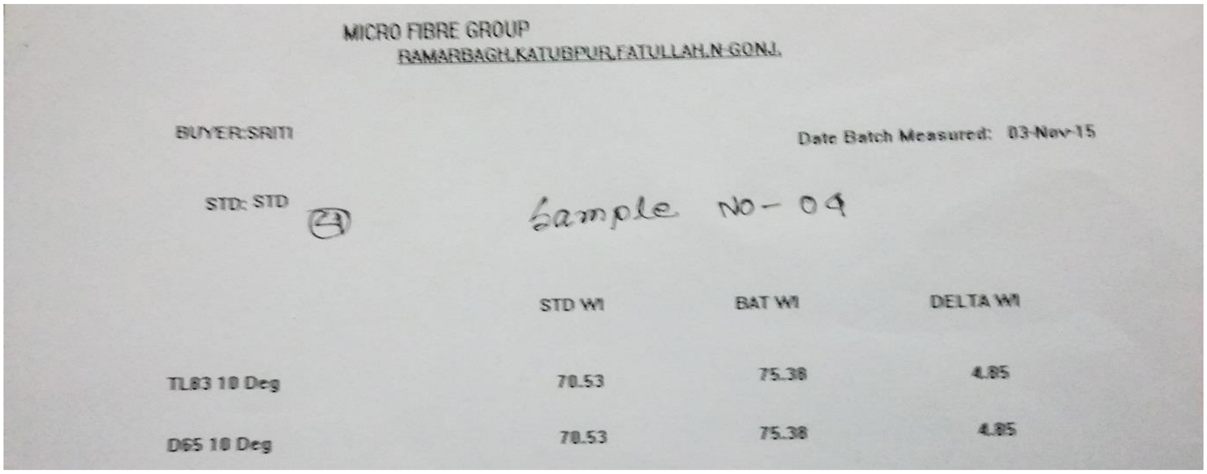
Date Batch Measured: 03-Nov-15

STD: STD

2

Sample NO- 03

	STD WI	BAT WI	DELTA WI
TL83 10 Deg	70.53	74.17	3.64
D65 10 Deg	70.53	74.17	3.64



MICRO FIBRE GROUP
RAMARBAGH,KATUBPUR,FATULLAH,N-GONJ.

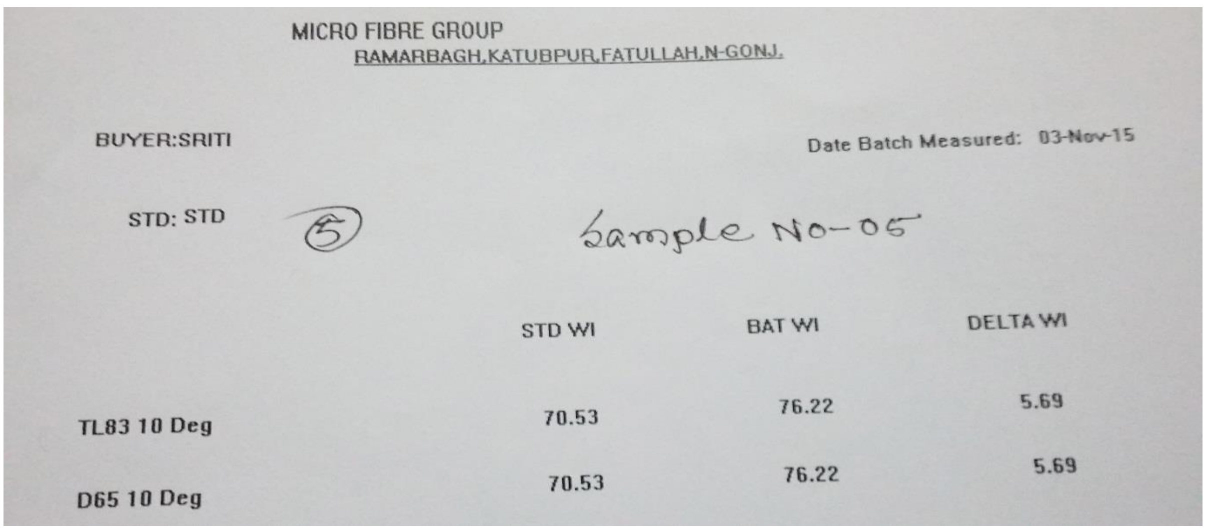
BUYER:SRITI

Date Batch Measured: 03-Nov-15

STD: STD

4 Sample No-04

	STD WI	BAT WI	DELTA WI
TL83 10 Deg	70.53	75.38	4.85
D65 10 Deg	70.53	75.38	4.85



MICRO FIBRE GROUP
RAMARBAGH,KATUBPUR,FATULLAH,N-GONJ.

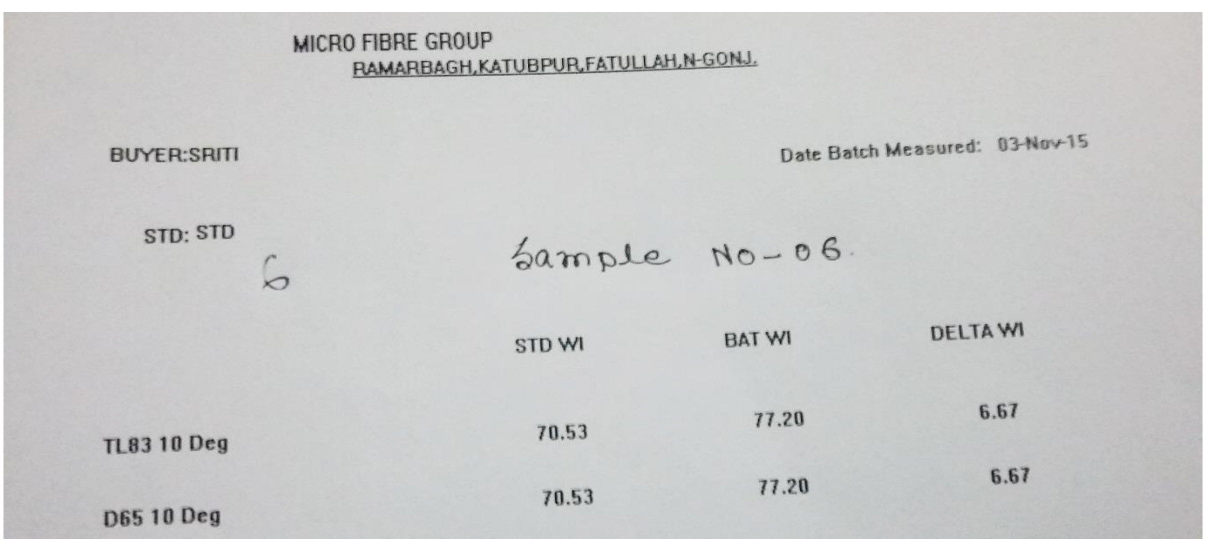
BUYER:SRITI

Date Batch Measured: 03-Nov-15

STD: STD

5 Sample No-05

	STD WI	BAT WI	DELTA WI
TL83 10 Deg	70.53	76.22	5.69
D65 10 Deg	70.53	76.22	5.69



MICRO FIBRE GROUP
RAMARBAGH,KATUBPUR,FATULLAH,N-GONJ.

BUYER:SRITI

Date Batch Measured: 03-Nov-15

STD: STD

6 Sample No-06.

	STD WI	BAT WI	DELTA WI
TL83 10 Deg	70.53	77.20	6.67
D65 10 Deg	70.53	77.20	6.67

MICRO FIBRE GROUP

RAMARBAGH,KATUBPUR,FATULLAH,N-GONJ.

BUYER:SRITI

Date Batch Measured: 03-Nov-15

STD: STD

8

Sample No- 07

	STD WI	BAT WI	DELTA WI
TL83 10 Deg	70.53	75.20	4.67
D65 10 Deg	70.53	75.20	4.67

MICRO FIBRE GROUP

RAMARBAGH,KATUBPUR,FATULLAH,N-GONJ.

BUYER:SRITI

Date Batch Measured: 03-Nov-15

STD: STD

7

Sample No- 08

	STD WI	BAT WI	DELTA WI
TL83 10 Deg	70.53	75.51	4.98
D65 10 Deg	70.53	75.51	4.98

MICRO FIBRE GROUP

RAMARBAGH,KATUBPUR,FATULLAH,N-GONJ.

BUYER:SRITI

Date Batch Measured: 03-Nov-15

STD: STD

9

Sample No- 09

	STD WI	BAT WI	DELTA WI
TL83 10 Deg	70.53	77.20	6.67
D65 10 Deg	70.53	77.20	6.67

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RAMARBAGH,KATUBPUR,FATULLAH,N-GONJ.

BUYER:SRITI

Date Batch Measured: 03-Nov-15

STD: STD

15

Sample No- 10

	STD WI	BAT WI	DELTA WI
TL83 10 Deg	70.53	73.89	3.36
D65 10 Deg	70.53	73.89	3.36

MICRO FIBRE GROUP

RAMARBAGH,KATUBPUR,FATULLAH,N-GONJ.

BUYER:SRITI

Date Batch Measured: 03-Nov-15

STD: STD

17

Sample No- 11

	STD WI	BAT WI	DELTA WI
TL83 10 Deg	70.53	74.26	3.73
D65 10 Deg	70.53	74.26	3.73

MICRO FIBRE GROUP

RAMERBAGH, KATUBPUR, FATULLAH, N-GONJ.

BUYER: SMRITI

Date Batch Measured: 03- Nov-2015

STD: STD

	STD WI	BAT WI	DELTA WI
TL83 10 Deg	70.53	77.49	6.96
D65 10 Deg	70.53	77.49	6.96

MICRO FIBRE GROUP
RAMARBAGH,KATUBPUR,FATULLAH,N-GONJ.

BUYER:SRITI

Date Batch Measured: 03-Nov-15

STD: STD
16

Sample NO-13

	STD WI	BAT WI	DELTA WI
TL83 10 Deg	70.53	75.06	4.52
D65 10 Deg	70.53	75.06	4.52

MICRO FIBRE GROUP
RAMARBAGH,KATUBPUR,FATULLAH,N-GONJ.

BUYER:SRITI

Date Batch Measured: 03-Nov-15

STD: STD
18

Sample NO-14

	STD WI	BAT WI	DELTA WI
TL83 10 Deg	70.53	75.72	5.19
D65 10 Deg	70.53	75.72	5.19

MICRO FIBRE GROUP
RAMARBAGH,KATUBPUR,FATULLAH,N-GONJ.

BUYER:SRITI

Date Batch Measured: 03-Nov-15

STD: STD
13

Sample NO-15

	STD WI	BAT WI	DELTA WI
TL83 10 Deg	70.53	77.79	7.26
D65 10 Deg	70.53	77.79	7.26

MICRO FIBRE GROUP
RAMARBAGH,KATUBPUR,FATULLAH,N-GONJ.

BUYER:SRITI

Date Batch Measured: 03-Nov-15

STD: STD
14

Sample NO-16

	STD WI	BAT WI	DELTA WI
TL83 10 Deg	70.53	76.71	6.18
D65 10 Deg	70.53	76.71	6.18

MICRO FIBRE GROUP
RAMARBAGH,KATUBPUR,FATULLAH,N-GONJ.

BUYER:SRITI

Date Batch Measured: 03-Nov-15

STD: STD
12

Sample-NO-17

	STD WI	BAT WI	DELTA WI
TL83 10 Deg	70.53	77.79	7.26
D65 10 Deg	70.53	77.79	7.26

MICRO FIBRE GROUP
RAMARBAGH,KATUBPUR,FATULLAH,N-GONJ.

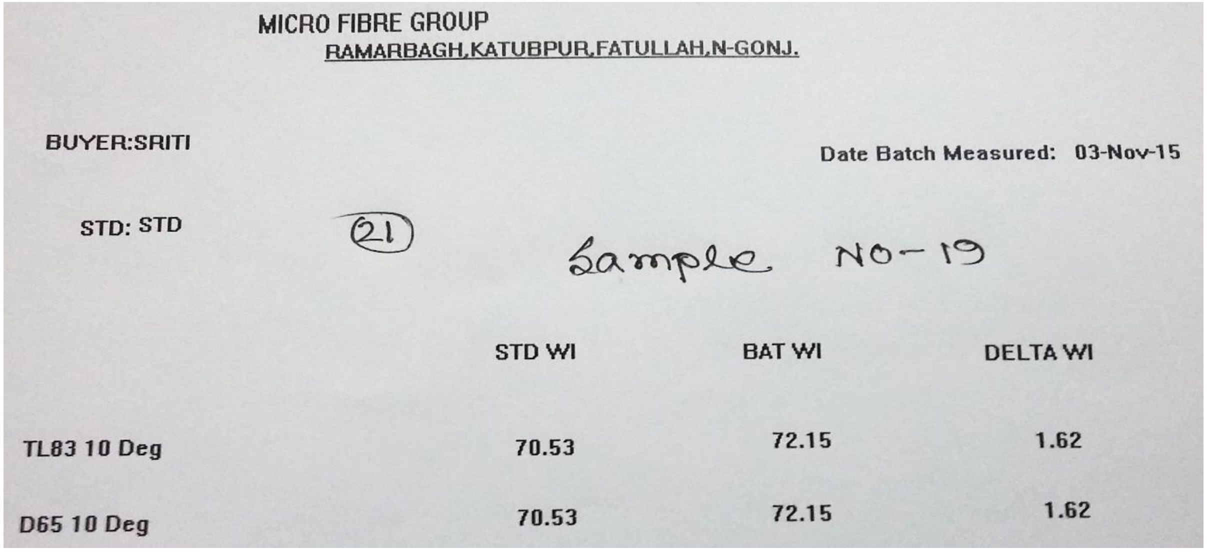
BUYER:SRITI

Date Batch Measured: 03-Nov-15

STD: STD
10

Sample No- 18

	STD WI	BAT WI	DELTA WI
TL83 10 Deg	70.53	77.69	7.16
D65 10 Deg	70.53	77.69	7.16


MICRO FIBRE GROUP
RAMARBAGH,KATUBPUR,FATULLAH,N-GONJ.

BUYER:SRITI

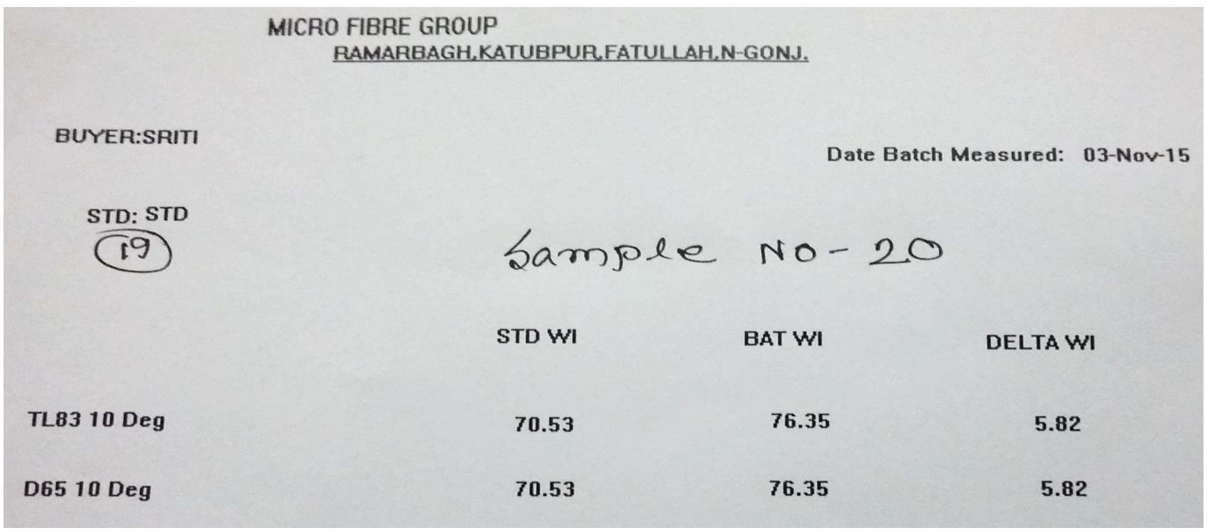
Date Batch Measured: 03-Nov-15

STD: STD

21

Sample NO-19

	STD WI	BAT WI	DELTA WI
TL83 10 Deg	70.53	72.15	1.62
D65 10 Deg	70.53	72.15	1.62


MICRO FIBRE GROUP
RAMARBAGH,KATUBPUR,FATULLAH,N-GONJ.

BUYER:SRITI

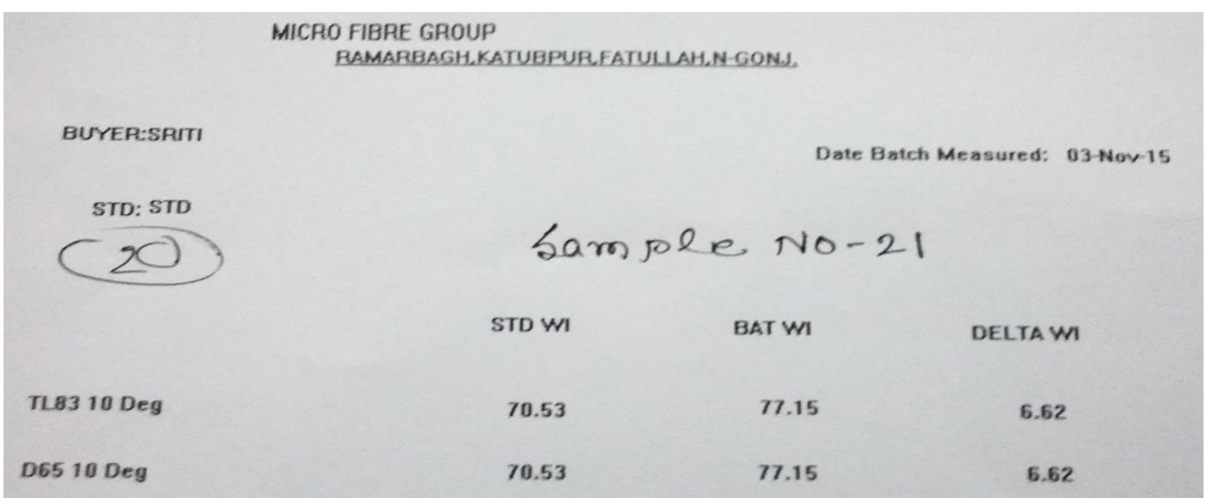
Date Batch Measured: 03-Nov-15

STD: STD

19

Sample NO-20

	STD WI	BAT WI	DELTA WI
TL83 10 Deg	70.53	76.35	5.82
D65 10 Deg	70.53	76.35	5.82


MICRO FIBRE GROUP
RAMARBAGH,KATUBPUR,FATULLAH,N-GONJ.

BUYER:SRITI

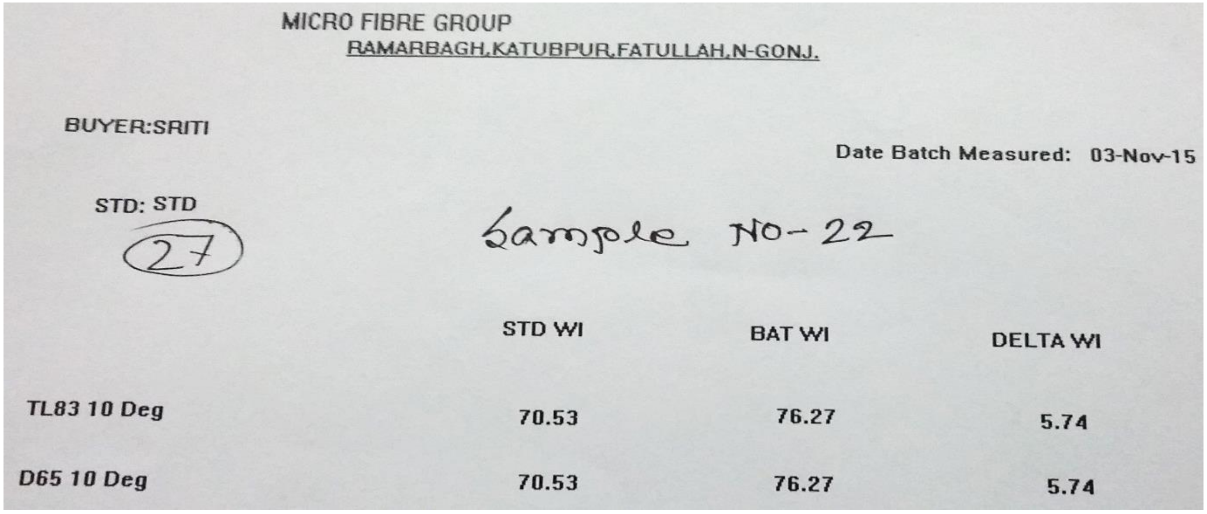
Date Batch Measured: 03-Nov-15

STD: STD

20

Sample NO-21

	STD WI	BAT WI	DELTA WI
TL83 10 Deg	70.53	77.15	6.62
D65 10 Deg	70.53	77.15	6.62



MICRO FIBRE GROUP

RAMARBAGH,KATUBPUR,FATULLAH,N-GONJ.

BUYER:SRITI

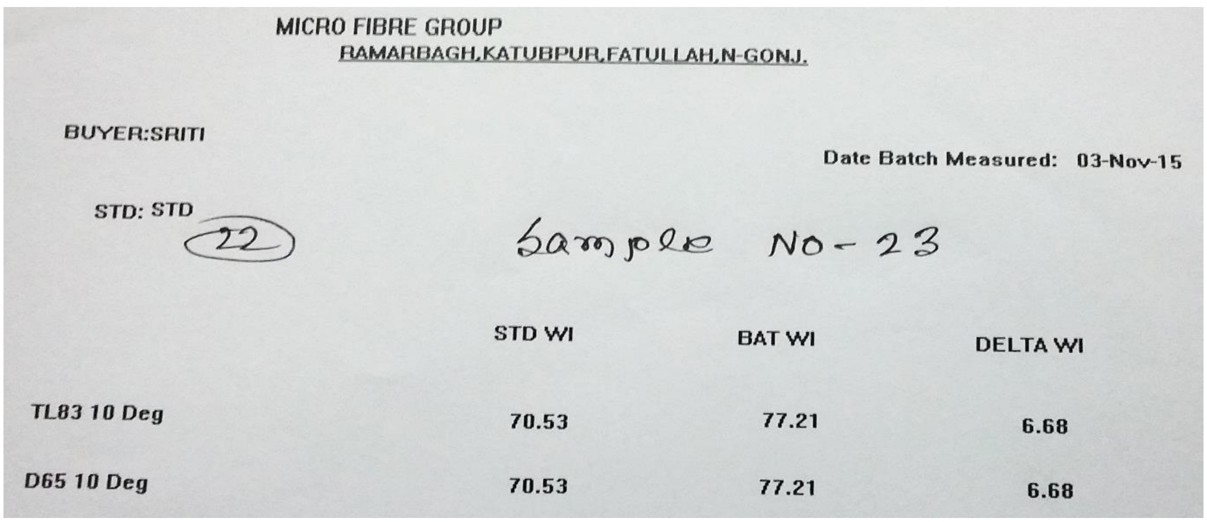
Date Batch Measured: 03-Nov-15

STD: STD

27

Sample NO-22

	STD WI	BAT WI	DELTA WI
TL83 10 Deg	70.53	76.27	5.74
D65 10 Deg	70.53	76.27	5.74



MICRO FIBRE GROUP

RAMARBAGH,KATUBPUR,FATULLAH,N-GONJ.

BUYER:SRITI

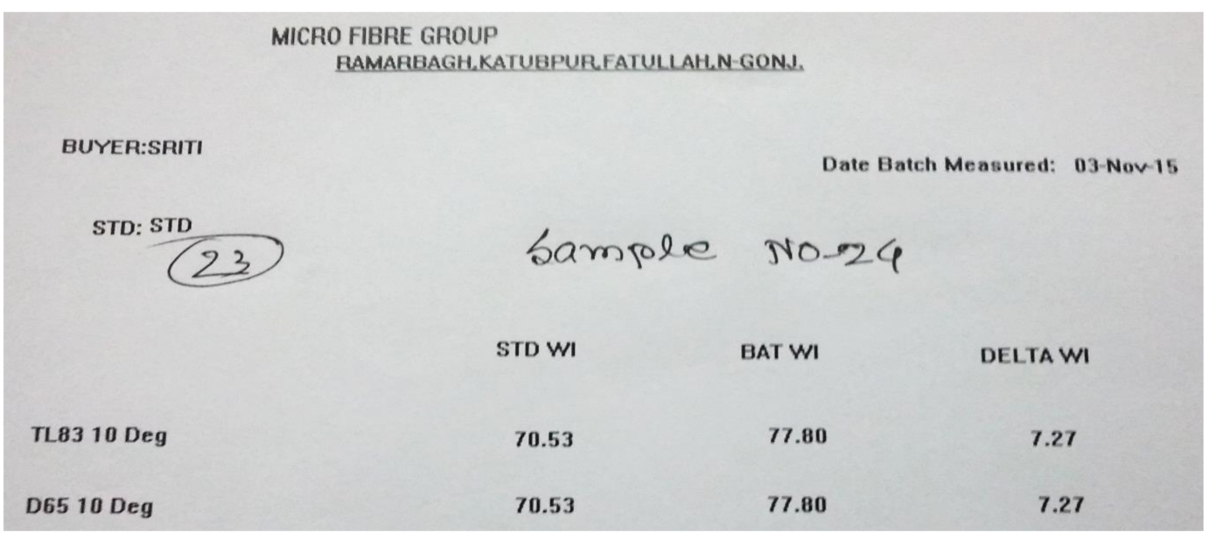
Date Batch Measured: 03-Nov-15

STD: STD

22

Sample NO-23

	STD WI	BAT WI	DELTA WI
TL83 10 Deg	70.53	77.21	6.68
D65 10 Deg	70.53	77.21	6.68



MICRO FIBRE GROUP

RAMARBAGH,KATUBPUR,FATULLAH,N-GONJ.

BUYER:SRITI

Date Batch Measured: 03-Nov-15

STD: STD

23

Sample NO-24

	STD WI	BAT WI	DELTA WI
TL83 10 Deg	70.53	77.80	7.27
D65 10 Deg	70.53	77.80	7.27

MICRO FIBRE GROUP
RAMARBAGH,KATUBPUR,FATULLAH,N-GONJ.

BUYER:SRITI

Date Batch Measured: 03-Nov-15

STD: STD

24

Sample No – 25

	STD WI	BAT WI	DELTA WI
TL83 10 Deg	70.53	76.85	6.31
D65 10 Deg	70.53	76.85	6.31

MICRO FIBRE GROUP
RAMARBAGH,KATUBPUR,FATULLAH,N-GONJ.

25

BUYER:SRITI

Date Batch Measured: 03-Nov-15

STD: STD

Sample No – 26

	STD WI	BAT WI	DELTA WI
TL83 10 Deg	70.53	77.69	7.16
D65 10 Deg	70.53	77.69	7.16

MICRO FIBRE GROUP
RAMARBAGH,KATUBPUR,FATULLAH,N-GONJ.

BUYER:SRITI

Date Batch Measured: 03-Nov-15

STD: STD

29

Sample No – 27

	STD WI	BAT WI	DELTA WI
TL83 10 Deg	70.53	77.86	7.33
D65 10 Deg	70.53	77.86	7.33